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THE ECOLOGY OF THE MANGROVES OF SOUTH FLORIDA: A COMMUNITY PROFILE

by

William E. Odum
Carole C. McIvor
Thomas J. Smith, III

Department of Environmental Sciences
University of Virginia
Charlottesville, Virginia 22901

Project Officer

Ken Adams
National Coastal Ecosystems Team
U.S. Fish and Wildlife Service
1010 Gause Boulevard
Slidell, Louisiana 70458

Performed for
National Coastal Ecosystems Team
Office of Biological Services
Fish and Wildlife Service
U.S. Department of the Interior
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and

New Orleans OCS Office
Bureau of Land Management
U.S. Department of the Interior
New Orleans, Louisiana 70130

CHAPTER 11. VALUE OF MANGROVE ECOSYSTEMS TO MAN

Mangrove swamps are often hot, fetid, mosquito-ridden, and almost impenetrable. As a consequence, they are frequently held in low regard. It is possible that more acres of mangrove, worldwide, have been obliterated by man in the name of "reclamation" than any other type of coastal environment. Reclamation, according to Webster's, means "to claim back, as of wasteland". Mangrove swamps are anything but wasteland, however, and it is important to establish this fact before a valuable resource is lost. We can think of six major categories of mangrove values to man; no doubt, there are more.

11.1 SHORELINE STABILIZATION AND STORM PROTECTION

The ability of all three Florida mangroves to trap, hold and, to some extent, stabilize intertidal sediments has been demonstrated repeatedly (reviewed by Scoffin 1970; Carlton 1974). The contemporary view of mangroves is that they function not as "land builders" as hypothesized by Davis (1940) and others, but as "stabilizers" of sediments that have been deposited largely by geomorphological processes (see section 3.2).

Gill (1970), Savage (1972), Teas (1977), and others have emphasized that land stabilization by mangroves is possible only where conditions are relatively quiescent and strong wave action and/or currents do not occur. Unfortunately, no one has devised a method to predict the threshold of physical conditions above which mangroves are unable to survive and stabilize the sediments. Certainly, this depends to some extent on substrate type; mangroves appear to withstand wave energy best on solid rock substrates with many cracks and crevices for root penetration. From our own experience, we suspect that mangroves on sandy and muddy substrates cannot tolerate any but the lowest wave energies, tidal currents much above 25 cm/s, or heavy, regular boat wakes.

The concept that the red mangrove is the best land stabilizer has been questioned by Savage (1972), Carlton (1974), and Teas (1977). These authors argue that the black mangrove (1) is easier to transplant as a seedling, (2) establishes its pneumatophore system more rapidly than the red mangrove develops prop roots, (3) has an underground root system that is better adapted to holding sediments (Teas 1977), (4) is more cold-hardy, and (5) can better tolerate "artificial" substrates such as dredge-spoil, finger fills, and causeways. Generally, the white mangrove is regarded as the poorest land stabilizer of the Florida mangroves (Hanlon et al. 1975).

Although mangroves are susceptible to hurricane damage (see section 12.1), they provide considerable protection to areas on their landward side. They cannot prevent all flooding damage, but they do mitigate the effects of waves and breakers. The degree of this protection is roughly proportional to the width of the mangrove zone. Very narrow fringing forests offer minimal protection while extensive stands of mangroves not only prevent wave damage, but reduce much of the flooding damage by damping and holding flood waters. Fosberg (1971) suggested that the November 1970 typhoon and accompanying storm surge that claimed between 300,000 and 500,000 human lives in Bangladesh might not have been so destructive if thousands of hectares of mangrove swamps had not been replaced with rice paddies.

11.2 HABITAT VALUE TO WILDLIFE

Florida mangrove ecosystems are important habitat for a wide variety of reptiles, amphibians, birds, and mammals (see sections 8, 9, and 10). Some of these animals are of commercial and sport importance (e.g., white-tailed deer, sea turtles, pink shrimp, spiny lobster, snook, grey snapper). Many of these are important to the south Florida tourist industry including the wading birds (e.g., egrets, wood stork, white ibis, herons) which nest in the mangrove zone.

11.3 IMPORTANCE TO THREATENED AND ENDANGERED SPECIES

The mangrove forests of south Florida are important habitat for at least seven endangered species, five endangered subspecies, and three threatened species (Federal Register 1980). The endangered species include the American crocodile, the hawksbill sea turtle, the Atlantic ridley sea turtle, the Florida manatee, the bald eagle, the American peregrine falcon, and the brown pelican. The endangered subspecies are the key deer (Odocoileus virginianus clavium), the Florida panther (Felis concolor coryi), the Barbados yellow warbler (Dendroica petechia petechia), the Atlantic saltmarsh snake (Nerodia fasciata taeniata) and the eastern indigo snake (Drymarchon corais couperi). Threatened species include the American alligator, the green sea turtle and the loggerhead sea turtle. Although all of these animals utilize mangrove habitat at times in their life histories, species that would be most adversely affected by widespread mangrove destruction are the American crocodile, the Florida panther, the American peregrine falcon, the brown pelican, and the Atlantic ridley sea turtle. The so-called mangrove fox squirrel (Sciurus niger avicennia) is widely believed to be a mangrove-dependent endangered species. This is not the case since it is currently regarded as "rare", not endangered, and, further, there is some question whether or not this is a legitimate sub-species (Hall 1981). As a final note, we should point out that the red wolf (Canis rufus), which is believed to be extinct in Florida, at one time used mangrove habitat in addition to other areas in south Florida.

11.4 VALUE TO SPORT AND COMMERCIAL FISHERIES

The fish and invertebrate fauna of mangrove waterways are closely linked to mangrove trees through (a) the habitat value of the aerial root structure and (b) the mangrove leaf detritus-based food web (see sections 6 and 7). The implications of these connections were discussed by Heald (1969), Odum (1970), Heald and Odum (1970), and Odum and Heald (1975b) in terms of support for commercial and sport fisheries.

A minimal list of mangrove-associated organisms of commercial or sport value includes oysters, blue crabs, spiny lobsters, pink shrimp, snook, mullet, menhaden, red drum, spotted sea trout, gray and other snapper, tarpon, sheepshead, ladyfish, jacks, gafftopsail catfish, and the jewfish. Heald and Odum (1970) pointed out that the commercial fisheries catch, excluding shrimp, in the area from Naples to Florida Bay was 2.7 million pounds in 1965. Almost all of the fish and shellfish which make up this catch utilize the mangrove habitat at some point during their life cycles. In addition, the Tortugas pink shrimp fishery, which produces in excess of 11 million pounds of shrimp a year (Idyll 1965a), is closely associated with the Everglades estuary and its mangrove-lined bays and rivers.

11.5 AESTHETICS, TOURISM AND THE INTANGIBLES

One value of the mangrove ecosystem, which is difficult to document in dollars or pounds of meat, is the aesthetic value to man. Admittedly, not all individuals find visits to mangrove swamps a pleasant experience. There are many others, however, who place a great deal of value on the extensive vistas of mangrove canopies, waterways, and associated wildlife and fishes of south Florida. In a sense, this mangrove belt along with the remaining sections of the freshwater Everglades and Big Cypress Swamp are the only remaining wilderness areas in this part of the United States.

Hundreds of thousands of visitors each year visit the Everglades National Park; part of the reason for many of these visits includes hopes of catching snook or gray snappers in the mangrove-lined waterways, seeing exotic wading birds, crocodiles, or panthers, or simply discovering

what a tropical mangrove forest looks like. The National Park Service, in an attempt to accommodate this last wish, maintains extensive boardwalks and canoe trails through the mangrove forests near Flamingo, Florida. In other, more developed parts of the State, small stands of mangroves or mangrove islands provide a feeling of wilderness in proximity to the rapidly burgeoning urban areas. A variety of tourist attractions including Fairchild Tropical Gardens near Miami and Tiki Gardens near St. Petersburg utilizes the exotic appearance of mangroves as a key ingredient in an attractive landscape. Clearly, mangroves contribute intangibly by diversifying the appearance of south Florida.

11.6 ECONOMIC PRODUCTS

Elsewhere in the world, mangrove forests serve as a renewable resource for many valuable products. For a full discussion of the potential uses of mangrove products, see de la Cruz (in press a), Morton (1965) for red mangrove products, and Moldenke (1967) for black mangrove products.

In many countries the bark of mangroves is used as a source of tannins and dyes. Since the bark is 20% to 30% tannin on a dry weight basis, it is an excellent source (Hanlon et al. 1975). Silviculture (forestry) of mangrove forests has been practiced extensively in Africa, Puerto Rico, and many parts of Southeast Asia (Holdridge 1940; Noakes 1955; Macnae 1968; Walsh 1974; Teas 1977). Mangrove wood makes a durable and water resistant timber which has been used successfully for residential buildings, boats, pilings, hogsheads, fence posts, and furniture (Kuenzler 1974; Hanlon et al. 1975). In Southeast Asia mangrove wood is widely used for high quality charcoal.

Morton (1965) mentions that red mangrove fruits are somtimes eaten by humans in Central America, but only by populations under duress and subject to starvation. Mangrove leaves have variously been used for teas, medicinal purposes, and livestock feeds. Mangrove teas must be drunk in small quantities and mixed with milk because of the high tannin content (Morton 1962); the milk binds the tannins and makes the beverage more palatable.

As a final note, we should point out that mangrove trees are responsible for contributing directly to one commercial product in Florida. The flowers of black mangroves are of considerable importance to the three million dollar (1965 figures) Florida honey industry (Morton 1964).

Other than the honey industry, most of these economic uses are somewhat destructive. There are many cases in which clear-cut mangrove forests have failed to regenerate successfully for many years because of lack of propagule dispersal or increased soil salinities (Teas 1979). We believe that the best use of Florida mangrove swamps will continue to be as preserved areas to support wildlife, fishing, shoreline stabilization, endangered species, and aesthetic values.